'Is It Live Or Is It Memorex?'

THE TUAV INITIAL OPERATIONAL TEST

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Introduction

Ever-increasing technological advances are improving the ground commander's situational awareness (SA) of the battlefield. Systems such as the Joint Surveillance Targeting Attack Radar System (JSTARS), Tactical Exploitation of National Capabilities (TENCAP), Army Reconnaissance Low, Guardrail, Quickfix, and Ground Surveillance Radar (GSR) provide senior leaders with unprecedented enemy SA. The integration of these systems with the Army's digitalization initiative helps further take the fog out of war, bringing the battlefield into better focus.

Commanders of the 4th Infantry, the Army's first digitized division, have become accustomed to always knowing where their units are on the battlefield, as well as having a good idea of the strength, location, and activity of the enemy. However, a shortfall was identified in the reconnaissance, intelligence, surveillance, and target acquisition (RISTA) assets available at the maneuver brigade level. It was determined that brigade commanders needed an aerial tool that provides day and night coverage of their area of interest (AOI) for extended periods of time. This tool should enhance the commander's enemy SA, target acquisition, and battle-damage assessment capabilities without increasing the number of soldiers that must be out in front and in harm's way. Hence, the Tactical Unmanned Aerial Vehicle (TUAV) Program was established as an Army acquisition category II program with Office of the Secretary of Defense oversight.

The Army's objective is to field an unmanned aerial vehicle system to the ground maneuver brigade commanders as quickly as possible. To accomplish this task, the TUAV Initial Operational Test (IOT) was conducted April 9-May 3, 2002. The U.S. Army Operational Test Command (USAOTC) mission was to plan and execute the test to collect and provide the data necessary to support the evaluation of the effectiveness, survivability, and suitability of a production-representative Block I system under realistic operational conditions.

The challenge during the IOT was to create a realistic operational environment at brigade level without incurring the costs and other test limitations associated with using the real intelligence sensors and large numbers of soldiers necessary to generate the tactical situation under which the brigade would normally operate. This article describes how USAOTC used modeling and simulation (M&S) to address this challenge.

Initial Operational Test

The approved scenario for this test called for two U.S. Army Brigade Combat Teams, working in conjunction with a host nation brigade, to provide stability to the newly formed autonomous province of Kazar, which had broken away from the country of Gordo to its north. The main threat within the test brigade's AOI would be low-level insurgency operations sponsored by the government of Gordo. These insurgency operations would include terrorist attacks, small-unit guerrilla activities, and ethnic cleansing. However, during the test, ethnic hostilities with Gordo would increase, and Gordo would begin to shift large numbers of its combat forces toward its southern border with Kazar in an apparent threat to retake Kazar by force. Once defined, the scenario was built in Janus, which was the entity-based combat simulation chosen to drive the test.

The final phase of the IOT focused on the TUAV's contribution to solving the brigade's RISTA requirements associated with the above scenario. The IOT was conducted in a command post exercise environment using a full brigade staff deployed in their tactical operations center (TOC). A battalion response cell, manned by player personnel, stimulated the brigade's command and control systems by conducting security and stability operations on battalion-level Janus workstations and reporting the conduct of those operations to the brigade through their Army Battle Command Systems.

The Extended Air Defense Simulation (EADSIM) replicated the friendly or blue force (BLUEFOR) intelligence sensors such as GSR, Quickfix, Guardrail, JSTARS, and TENCAP. Through its interface with Janus, EADSIM also provided BLUEFOR position locations to the Enhanced Tactical Simulation Interface Unit (ETSIU). In turn, ETSIU converted the sensor and position location data generated by EADSIM into the standard message formats required for the brigade's Army Battle Command Systems. The division staff manned a white cell that provided command, control, communications, and intelligence (C3I) feeds down to the brigade TOC to support cross-cueing of sensors. Through its role as the test unit's higher headquarters, the white cell also assisted the test team in ensuring that the test objectives were met by sending down scripted intelligence messages, managing the division's airspace, and issuing operations and fragmentary orders to the brigade.

A combination of live and virtual targets was used to portray the opposing force (OPFOR) during the IOT. The live targets operated within the brigade's AOI and consisted of a mixture of 30 tracked and up to 60 wheeled vehicles. The live-target vehicles were equipped with the Mobile Automated Instrumentation Suite (MAIS), which provided protocol data units (PDUs) on each activated target vehicle to Janus. The PDUs told Janus what the targets were and where they were located. Janus could then select the appropriate icon to represent each target and post them on the map display within the simulation in accordance with their actual field locations.

Once the live-target vehicles were depicted in Janus, the BLUEFOR sensors being simulated in EADSIM were able to detect them. As the live target vehicles moved around, MAIS kept Janus updated on the current locations of the vehicles by sending out additional PDUs. Virtual targets, also detectable by the EADSIM sensors, were moved in and out of the brigade's AOI in accordance with the tactical scenario.

As virtual targets were moved into the brigade's AOI, they were seamlessly transitioned into live targets. This was accomplished by moving the virtual targets to the map locations, within the simulation, that corresponded with the actual field locations of the live targets that were to take their place. As the virtual targets arrived at their designated transition grid coordinates, they were placed in Janus' "hide boxes," which prevented them from being seen by EADSIM, and the MAIS instrumentation on the corresponding live-target vehicles was immediately activated.

To add even more realism, two live SA-9s, one live SA-8, and one live TAR-75 radar were also employed as targets. Although these real-threat weapon systems were not MAIS-equipped, they were still portrayed in the simulation by simply creating Janus entities to replicate them and manually inputting their actual locations into the simulation. Therefore, it did not matter whether the employment of the TUAV was cued by the movement of virtual OPFOR vehicles detected by a simulated JSTARS or by the radar signature of a virtual TAR-75 detected by a simulated Guardrail.

When the TUAV arrived on station, it found live OPFOR vehicles or, in the second case, an actual TAR-75 radar to report back to the brigade TOC. This gave the test officer the ability to use the intelligence generated by the virtual sensors, which he controlled to stimulate, by means of the white cell, the brigade's employment of the TUAV while maintaining complete operational realism. This was accomplished to the point where a test player soldier commented to visiting GEN Paul J. Kern, Commanding General, Army Materiel Command, "First, I was receiving live feeds, then I flipped a switch, and I was receiving simulated feeds. I could tell no difference between the live and the simulated feeds."

Simulation And Stimulation

The primary purpose of simulation and stimulation is to provide operational realism when using real assets is either unfeasible or impractical. To create the above operational environment using only live assets would have been extremely difficult, if not impossible. It would have also been cost-prohibitive. However, through the use of M&S, USAOTC created a synthetic operational environment that supplied all the C3I feeds necessary to provide realistic stresses on the brigade commander and his staff. These stresses forced the brigade staff to function as if they were in a real combat environment instead of possibly fixating on the TUAV.

The simulation and stimulation architecture also gave the brigade commander and his staff a doctrinally correct and combat realistic operational environment in which to employ the system-under-test (SUT). In other words, the operational environment created by the simulation and stimulation supported using the TUAV as an integrated part of the commander's concept of operation to accomplish a real-world mission instead of as a tool used in isolation.

Conclusion

To accommodate the operational test requirements for the Future Combat Systems and other new developments, USAOTC is developing a digitized synthetic network-centric battlefield environment. Known as the OTC Analytic Simulation and Instrumentation Suite (OASIS), this suite of models, simulations, and instrumentation (MSI) systems and analytic software will enable the testing of any system or platform within the overall battlefield environment. Specific near-term examples of OASIS initiatives are the Intelligence Modeling and Simulation for Evaluation (IMASE) and the Extensible, C3I Instrumentation System, Fire Support Application (ExCIS-FSA).

IMASE is projected to provide the robust, high-fidelity, multiple classification level, live, virtual, and constructive threat environment required for future systems testing. A Tactical Simulation-Operational Test modernization, IMASE will use MSI to automate scenario generation and SUT performance scoring. ExCIS-FSA, a fire support automated test system modernization effort, will provide the comprehensive and high-fidelity instrumentation and data collection capability required for testing fire support systems.

While OASIS looks to the future, USAOTC's near-term goal is to improve upon the M&S successes realized during this IOT so that warfighters involved in upcoming operational tests will have a harder time determining whether it is "live or Memorex."

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